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| 10/535,026  | 05/11/2005  | Raghu Nath Bhattacharya | NREL 02-13          | 2043             |
| Paul J White<br>NREL<br>1617 Cole Boulevard<br>Golden, CO 80401 |             |                         |                     |                  |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/535,026

**Applicant(s)**

BHATTACHARYA ET AL.

**Examiner**

EDNA WONG

**Art Unit**

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 and 7-28 is/are pending in the application.
- 4a) Of the above claim(s) 12-14 and 16-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-11 and 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 December 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

This is in response to the Amendment dated December 1, 2008. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

### ***Response to Arguments***

#### **Election/Restrictions**

Applicant's election of Group I, claims **1-4, 7-11 and 15**, in the reply filed on December 1, 2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

The requirement is still deemed proper and is therefore made FINAL.

Accordingly, claims **12-14 and 16-28** are withdrawn from consideration as being directed to a non-elected invention.

#### **Drawings**

The drawings were received on December 1, 2008. These drawings are acceptable.

#### **Specification**

The disclosure has been objected to because of minor informalities.

The objection of the disclosure has been withdrawn in view of Applicants'

amendment.

#### Claim Objections

Claim **2** is objected to because of the following informalities:

The objection of claim 2 has been withdrawn in view of Applicants' amendment.

#### Claim Rejections - 35 USC § 112

Claims **2-11** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 2-11 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

#### Claim Rejections - 35 USC § 102/103

I. Claims **1-2, 5 and 8-10** have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Diaz et al.** ("Preparation of Biaxially Cube Textured Ag, Cu-Au and Cu-Au-Ag Films on Cu Substrates for HTS Coated Conductor Applications", *Supercond. Sci. Technol.*, Vol. 14 (2001), pp. 576-582).

The rejection of claims 1-2, 5 and 8-10 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Diaz et al. has been

withdrawn in view of Applicants' amendment.

II. Claim 15 has been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Diaz et al.** ("Preparation of Biaxially Cube Textured Ag, Cu-Au and Cu-Au-Ag Films on Cu Substrates for HTS Coated Conductor Applications", *Supercond. Sci. Technol.*, Vol. 14 (2001), pp. 576-582).

The rejection of claim 15 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Diaz et al. is as applied in the Office Action dated September 2, 2008 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that claim 15 is amended to recite "A method of depositing a gold layer having pure biaxial texturing onto a substrate comprising electrodepositing gold at a current density of between about 0.10 and 3.5 mA/cm<sup>2</sup> for between about 1 and 60 minutes" (emphasis added). Diaz fails to disclose or suggest at least these recitations as discussed above for claim 1.

In response, a preamble is not necessarily accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. *In re Hirao* 535 F. 2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie* 187 F 2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Claim Rejections - 35 USC § 103

I. Claims **3-4 and 11** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Diaz et al.** ("Preparation of Biaxially Cube Textured Ag, Cu-Au and Cu-Au-Ag Films on Cu Substrates for HTS Coated Conductor Applications", *Supercond. Sci. Technol.*, Vol. 14 (2001), pp. 576-582) as applied to claims 1-2, 5 and 8-10 above.

The rejection of claims 3-4 and 11 under 35 U.S.C. 103(a) as being unpatentable over Diaz et al. as applied to claims 1-2, 5 and 8-10 above has been withdrawn in view of Applicants' amendment.

II. Claims **6 and 7** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Diaz et al.** ("Preparation of Biaxially Cube Textured Ag, Cu-Au and Cu-Au-Ag Films on Cu Substrates for HTS Coated Conductor Applications", *Supercond. Sci. Technol.*, Vol. 14 (2001), pp. 576-582) as applied to claims 1-2, 5 and 8-10 above, and further in view of **Kobori et al.** (US Patent No. 6,821,406 B2).

The rejection of claims 6 and 7 under 35 U.S.C. 103(a) as being unpatentable over Diaz et al. as applied to claims 1-2, 5 and 8-10 above, and further in view of Kobori et al. has been withdrawn in view of Applicants' amendment.

***Response to Amendment***

***Claim Rejections - 35 USC § 112***

I. Claims **1-4 and 7-11** are rejected under 35 U.S.C. 112, second paragraph, as

being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

Claim 1

line 1 (*preamble*), recites “a gold layer”.

line 2 (*body*), recites “electrodepositing gold”.

line 5 (*body*), recites “the gold layer”.

The gold layer recited in line 5 is the latter mention of the element referable to its earlier recitation in the preamble and not to the electrodeposited gold in the body of claim 1. Thus, there is a gap between the electrodeposited gold and the gold layer.

I. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

Claim 1

lines 2-3, recite “electrodepositing gold onto a surface of the substrate at a current density of less than about 5.0 mA/cm<sup>2</sup> for at least about 1 minute”.

Claim 10

lines 1-2, recite “wherein forming is by epitaxially depositing the gold layer on the

biaxially textured substrate”.

The biaxially textured substrate is being treated with two unrelated steps of depositing gold.

“Forming” recited in lines 1-2 is the latter mention of the element referable to its earlier recitation in the preamble of claim 1 and not to the step of electrodepositing gold in the body of the claim 1. Thus, there is a gap between electrodepositing gold and forming is by epitaxially depositing the gold layer.

### ***Claim Rejections - 35 USC § 103***

I. Claims **1-4 and 7-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Goyal et al.** (US Patent No. 5,741,377) in combination with **Glezen et al.** (US Patent No. 5,873,992), **Hirai et al.** (“Growth of Gold Plating Film on Various Nickel Substrates”, *Hyomen Gijutsu* (1992), Vol. 43, No. 9, pp. 868-872) and **Uzoh et al.** (US Patent No. 6,465,376 B2).

Goyal teaches a method of forming a gold layer having pure biaxial texturing on a nickel substrate, the method comprising:

- electrodepositing gold (= a thick layer Ag (100  $\mu\text{m}$ ) was electroplated using a standard electroplating technique) onto a surface of the substrate (= on a cube textured Ni substrate made according to the method described) at a current density (col. 4, lines 19-20; col. 8, lines 61-64; and col. 9, lines 48-50), and
- annealing the gold (= heating the laminate to a sufficient temperature and for a



sufficient time to induce epitaxy in the material to form a biaxially textured laminate) [col. 4, lines 21-23; and cols. 14-15, claims 11-13].

The method further comprises biaxially texturing the substrate prior to electrodepositing the gold (= rolling and annealing a base metal perform to form a biaxially textured substrate having a surface) [col. 4, lines 15-18].

The method further comprises rolling the substrate to biaxially texture the substrate (= rolling and annealing a base metal perform to form a biaxially textured substrate having a surface) [col. 4, lines 15-18].

Forming is by epitaxially depositing the gold on the biaxially textured substrate (= an epitaxial layer of another material is grown on the textured substrate (or on a barrier layer as the case may be) using any of a variety of techniques) [col. 5, lines 42-46].

The method of Goyal differs from the instant invention because Goyal does not disclose the following:

- a. Wherein the current density is less than about  $5.0 \text{ mA/cm}^2$  for at least about 1 minute, as recited in claim 1.
- b. Wherein electrodepositing the gold is at a current density of between about  $0.10$  and  $3.5 \text{ mA/cm}^2$  for between about 1 and 60 minutes, as recited in claim 2.
- c. Wherein electrodepositing the gold is at a current density of between about  $0.13$  and  $0.30 \text{ mA/cm}^2$  for between about 30 and 60 minutes, as recited in claim 3.

d. Wherein electrodepositing the gold is at a current density of about 0.13 mA/cm<sup>2</sup> for between about 45 and 60 minutes, as recited in claim 4.

Goyal teaches that a thick layer Ag (100  $\mu$ m) was electroplated using a standard electroplating technique (col. 9, lines 48-50).

Like Goyal, **Glezen** teaches electroplating a surface having surface irregularities with gold (col. 8, lines 19-26; and col. 11, "Procedure III"). Seven gold layers were applied at various current densities and electroplating times utilizing Procedure III (col. 12, lines 1-15).

Electrodepositing the gold is at a current density of less than about 5.0 mA/cm<sup>2</sup> for at least about 1 minute, and at a current density of between about 0.10 and 3.5 mA/cm<sup>2</sup> for between about 1 and 60 minutes (col.12, Table1).

Electroplating at low electroplating rates,  $R_L$ , utilizing low electroplating current densities,  $J_L$ , will result in an electroplated layer having a surface roughness less than that of the underlying layer upon which it is electroplated, with roughness decreasing with decreasing  $R_H$  and  $J_H$ . The inventors have also determined that electroplating at high electroplating rates,  $R_H$ , utilizing high electroplating current densities,  $J_H$ , will result in an electroplated layer having a surface roughness greater than that of the underlying layer upon which it is electroplated, with roughness increasing with increasing  $R_H$  and  $J_H$ . An intermediate electroplating rate  $R_O$ , utilizing an intermediate current density  $J_O$ , such that  $R_L < R_O < R_H$ , and  $J_L, J_O, J_H$ , will result in an electroplated layer having a surface roughness equal to that of the underlying layer upon which it is electroplated

(col. 7, lines 29-44).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the gold electroplating described by Goyal with (a) to (d) above because the current densities and electroplating times are result effective variables and one having ordinary skill in the art has the skill to calculate the current densities and electroplating times that would have determined the success of the desired reaction to occur (MPEP § 2141.03 and § 2144.05).

Utilizing low electroplating current densities,  $J_L$ , would have resulted in an electroplated layer having a surface roughness less than that of the underlying layer upon which it is electroplated, with roughness decreasing with decreasing  $R_H$  and  $J_H$ , and utilizing an intermediate current density  $J_O$ , such that  $R_L < R_O < R_H$ , and  $J_L, J_O, J_H$ , would have resulted in an electroplated layer having a surface roughness equal to that of the underlying layer upon which it is electroplated as taught by Glezen (col. 7, lines 29-44).

Furthermore, *Hirai* teaches epitaxial growth of a gold film on a nickel substrate. The gold plating was conducted in a solution primarily composed of gold potassium cyanide at 33K and pH = 6.5 with a c.d. of 5 mA/cm<sup>2</sup> (abstract).

e.     Wherein the annealing is in forming gas at between about 500 and 600 °C for between about 12 and 60 hours to increase the biaxial texturing in the gold layer, as recited in claim 1.

f. Wherein annealing the gold layer is at about 550 °C for about 48 hours to increase the biaxial texturing in the gold layer, as recited in claim 7.

Goyal teaches heating the laminate to a sufficient temperature and for a sufficient time to induce epitaxy in the material to form a biaxially textured laminate (col. 4, lines 21-23).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the annealing described by Goyal with (e) and (f) above because the annealing temperature and time are effective variables and one having ordinary skill in the art has the skill to calculate the annealing temperature and time that would have determined the success of the desired reaction to occur, i.e., sufficient to induce epitaxy (MPEP § 2141.03 and § 2144.05).

Furthermore, Goyal teaches that the Au/Cu composite structure was annealed at 800°C in vacuum. **Uzoh** teaches that annealing is typically carried out in an atmosphere of an inert gas such as argon, helium, or nitrogen or under vacuum ambient or in a reducing ambient such as H<sub>2</sub> or forming gas (N<sub>2</sub>+H<sub>2</sub>) [col. 3, lines 28-31]. Forming gas would have been functionally equivalent to the vacuum in annealing as taught by Uzoh.

g. The method further comprises repeating the electrodepositing step to increase the thickness of the gold, as recited in claim 11.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method described by Goyal by repeating the

electrodepositing step to increase the thickness of the gold because the repetition of steps to provide the same results is well within the skill of one having ordinary skill in the art. The concept of duplication is not patentable. *St. Regis Paper Co. v. Bemis Co. Inc.*, 193 USPQ 8, 11 (7th Cir. 1977). While this decision relates to the duplication of parts, there is no reason why such duplication cannot be extended to a process step.

II. Claims 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Goyal et al.** (US Patent No. 5,741,377) in combination with **Glezen et al.** (US Patent No. 5,873,992) and **Hirai et al.** ("Growth of Gold Plating Film on Various Nickel Substrates", *Hyomen Gijutsu* (1992), Vol. 43, No. 9, pp. 868-872).

Goyal, Glezen and Hirai are as applied as discussed above and incorporated herein.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**Nikolova** ("Structure of Gold Coatings and Gold Electrodeposition Processes From Cyanide-Free Electrolytes. II. Effect of the Substrate and Dependence of the Texture to Coating Formation", *Izvestiya po Khimiya* (1977), Vol. 10, No. 3, pp. 345-60) is cited to teach electroplating Au on electroplated Ni (abstract).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **EDNA WONG** whose telephone number is (571) 272-1349. The examiner can normally be reached on **Mon-Fri 7:30 am to 4:00 pm**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edna Wong/  
Primary Examiner  
Art Unit 1795

EW  
January 22, 2009